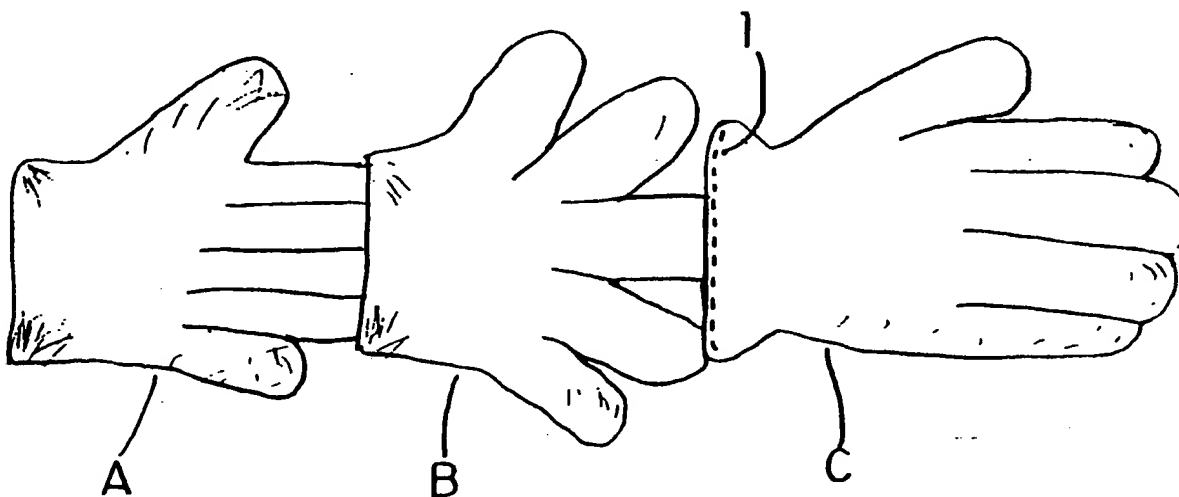




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/US91/07709</b></p> <p>(22) International Filing Date: <b>15 October 1991 (15.10.91)</b></p> <p>(30) Priority data:              603,078                      25 October 1990 (25.10.90)      US              720,311                      25 June 1991 (25.06.91)              US</p> <p>(71) Applicant: <b>W.L. GORE &amp; ASSOCIATES, INC. [US/US];</b>              551 Paper Mill Road, P.O. Box 9206, Newark, DE 19714 (US).</p> <p>(72) Inventor: <b>WORDEN, Gregory ; 60 Matthew Bathon Court,</b>              Elkton, MD 21921 (US).</p> <p>(74) Agents: <b>SAMUELS, Gary, A. et al.; W.L. Gore &amp; Associates, Inc., 551 Paper Mill Road, P.O. Box 9206, Newark, DE 19714 (US).</b></p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p> <p><b>Published</b>  <i>With international search report.</i></p>

(54) Title: **WATERPROOF GLOVE HAVING A LINER RETENTION SYSTEM**

## (57) Abstract

A waterproof glove having a liner retention system comprising an outer shell (C), a waterproof or a waterproof water vapor-transmitting insert (2), and an inner fibrous insulation (A) which entangles with the fibrous backing layer (4) of the waterproof insert (2) to give good liner retention. Useful for ski gloves, mittens, work gloves and the like under severe weather conditions.

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TITLE OF INVENTION

WATERPROOF GLOVE HAVING A LINER RETENTION SYSTEM

FIELD OF THE INVENTION

The invention relates broadly to lined waterproof gloves or mittens for protection during adverse weather conditions, and particularly to gloves having a waterproof insert and an insulative liner.

BACKGROUND OF THE INVENTION

A glove manufactured for use under severe weather conditions is usually constructed at present with an insulative liner next to the skin of the wearer, which is enclosed in a waterproof insert, and both these layers are enclosed in an outer shell. The insulative liner provides comfort under cold weather conditions and the waterproof insert keeps the insulation of the glove and the hand of the wearer dry. The outer shell provides protection to the inserts and the liner and fashion qualities.

With the introduction of waterproof inserts into gloves certain problems arise. One major problem has been keeping the insert in place between the inner liner, usually the insulation, and the outer shell of fabric and/or leather. The process for stabilizing the insert has become known in the industry as insert retention. Since the only connection point for all three layers is the cuff, the insert floats between the inner liner and outer shell. The insert is not held in place by stitching, because that will violate the integrity of the waterproof membrane. Without the insert firmly held in place, the insert and inner liner can invert upon removal of the hand from the glove. Often the liner and insert cannot be reinverted and the glove can no longer be worn at all. If the liner can be reinverted, the act usually results in the rupturing of the waterproof insert, resulting in a non-waterproof glove.

To ensure the highest quality possible, a method of insert and liner retention is needed for all gloves which are assembled in separate layers.

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SUMMARY OF THE INVENTION

The present invention comprises hand coverings, i.e. gloves or mittens having a liner of fibrous insulation and a waterproof insert within an outer shell. The shell is usually leather or cloth. The waterproof insert preferably comprises a layer of porous hydrophobic polymeric membrane, which is waterproof to liquid water and which transmits water vapor. Preferably it is expanded polytetrafluoroethylene (PTFE) laminated to or coated with a layer of water vapor-transmitting polyurethane or other polymer; but it may be any waterproof insert, such as neoprene, polyvinyl chloride, rubber, latex, or polyurethane. It can also be a microporous polymer membrane made from polypropylene, polyurethane, or a structure embodying both microporous hydrophobic polymer and hydrophilic polymer embedded in its pores or layered on its surface. The waterproof insert is in turn bonded on the inside by heat or an adhesive to a non-woven or brush woven, entangleable textile fiber scrim which may be polyester or polyamide, for example. The adhesive may be in the form of a liquid or a powdered solid.

It may alternatively be useful to include an entangleable scrim between the outer shell and the waterproof insert. This requires the scrim to be bonded to the outside of the waterproof insert and requires that the shell have an entangleable layer on the inside. Also an entangleable resin layer may be bonded to both the inside and the outside of the waterproof insert so that one side may entangle with the outer shell and the other side with the inner insulation at the same time. The shell may have a rough enough interior surface to entangle with the fibers of the scrim or may have a fibrous or entangleable foam material bonded to its interior surface.

All three layers of the glove construction are held in place by stitching only at the cuff of the glove. In a preferred embodiment, the inner layer is the fibrous insulation, the middle layer comprises the waterproof insert layer (the preferably expanded PTFE layer facing outwardly), and the outer layer comprising the protective shell.

Upon wearing the glove for a short period, it has been discovered that the fibers of the insulation layer will entangle with fibers from the textile scrim layer of the middle layer to an

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extent that it requires several pounds of pull-out strength per glove finger to separate the insulation and the waterproof middle layer from each other. This entanglement results in a glove which will not have its lining invert under normal hand removal procedures.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the insulation fitting into the waterproof insert, which fits into the outer shell of a glove of the invention.

Figure 2 is a cross-sectional view of a preferred waterproof insert of the glove of the invention.

Figure 3 is a photomicrograph of entangled fibers of the insulation and the inner fabric layer of the waterproof insert of the glove of the invention.

Figures 4, 5, and 6 are cross-sectional views of segments of gloves of the invention which describe alternative arrangements of layers.

#### DETAILED DESCRIPTION OF THE INVENTION

In terms of the figures, the glove of the invention is now described in detail.

Figure 1 shows how the three principal layers of the invention fit together with the insulation layer A fitting inside a middle waterproof water vapor transmitting insert B, which in turn fits inside outer protective shell C. Layers, A, B, and C when fitted into each other in proper order are joined together by preferably stitching them together at the cuff of the glove as shown at point 1, as shown on the outside of shell C in Figure 1. Shell C may be leather or fabric or a combination of both materials, such as in ski gloves or work gloves, for example. The shell fabric may be cotton or synthetic textile material.

Figure 2 displays a cross-sectional view of one variant of the waterproof water vapor transmitting insert B portion of the glove of the invention. The waterproof material 2 is on the outside of the insert and is preferably porous expanded PTFE membrane

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material, such as disclosed in U.S. Patent Nos. 3,953,566, 3,962,153, 4,096,227, and 4,187,390, assigned to W. L. Gore & Associates, Inc. These materials are well known in the art for being waterproof, but at the same time being capable of transmitting large amounts of water vapor, such as from the skin of a wearer to the outside of an article of clothing containing the materials. Layer 3 is a water vapor transmitting layer of polyurethane polymer bonded to PTFE layer 2 to provide a hydrophilic oil resistant, but water vapor transmitting layer, between the PTFE layer 2 and the skin of a wearer of the glove, such as described in U.S. Patent Nos. 4,194,041 and 4,443,511. Other waterproof and water vapor transmitting materials, such as those described above may be used. A non-woven textile fiber scrim material 4 is bonded to polyurethane layer 3 by preferably heat bonding, although a water vapor transmitting polyurethane adhesive may be used. Material 4 could be substituted by brush-woven fabric as an alternative if such fabric provides enough free fibers such that they will entangle with the fibers of the insulation to the degree necessary to provide adequate insert retention by entanglement and mechanical bonding of the two layers. Examples of suitable layer 4 materials are Lutrabond® laminate of spunbonded polyamide 6 and Cerex® laminate of spunbonded polyamide 6,6. Non-woven polyester fiber materials may also be used as may fibers of glass, rayon, or polypropylene as may carded non-woven materials.

Figure 3 shows a photomicrograph of entangled fibers 5 of scrim layer 4 of the insert and fibers 6 of the insulation.

Figure 4 depicts a cross-sectional view of the glove of Figure 1. A is the fibrous insulation and C is the outer protective shell. Insert layer B is seen in Figure 4 to comprise waterproof material 2, polyurethane layer 3 and scrim 4.

In Figure 5, A is the fibrous insulation, C is the shell and 2 is the waterproof layer.

In Figure 6, A is the fibrous insulation, C is the shell, 2 is the waterproof layer and 4 is the scrim. In this embodiment, the shell contains a fibrous material.

Insulation layer A, the innermost layer of the glove, next to the skin of the wearer, may be almost any suitable insulation material known in the art to be useful in insulating gloves,

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except those foamed insulating materials which will not entangle with fibers from layer 4 of insert B and material and other organic fibers which mat when wetted. Examples of suitable insulation materials include Thinsulate® polyolefin/polyester, Fiberfill® polyester, Thermolite® polyester. The insulation may be attached to a textile layer to hold the insulation material together against flexing and other forms of wear during use of the glove containing it.

The inventive steps and combinations of materials also apply to mittens as an alternative form of gloves, since they function in the same way as gloves as regards liner retention.

I CLAIM:

1. A lined waterproof hand covering comprising in order inside to outside:
  - (a) a layer of fibrous insulation;
  - (b) a waterproof water vapor-transmitting insert comprising
    - (i) an outer porous polymeric membrane bonded to;
    - (ii) a hydrophilic water vapor transmitting polyurethane layer, which is in turn bonded to;
    - (iii) a fibrous textile scrim layer, wherein the scrim is adjacent the fibrous insulation; and
  - (c) an outer protective shell wherein said insulation, said insert, and said shell are attached to each other at the cuff of said glove;wherein fibers of the fibrous insulation are entangled with fibers of the fibrous textile scrim.
2. A hand covering of Claim 1 wherein said attachment to said cuff is by stitching or adhesive.
3. A hand covering of Claim 1 wherein said porous polymeric membrane is expanded polytetrafluoroethylene.
4. A hand covering of Claim 1, 2, or 3 in the form of a mitten.
5. A hand covering of Claim 1, 2, or 3 in the form of a glove.
6. A lined waterproof hand covering comprising in order inside to outside:
  - (a) a layer of fibrous insulation;
  - (b) a waterproof insert comprising a porous membrane and a fibrous textile scrim layer bonded to said membrane wherein the scrim is adjacent the fibrous insulation; and
  - (c) an outer protective shell wherein said insulation, said insert, and said shell are attached to each other at the cuff of said glove;wherein fibers of the fibrous insulation are entangled with fibers of said fibrous textile scrim.
7. A lined waterproof hand covering comprising in order inside to outside:
  - (a) a layer of fibrous insulation;
  - (b) a waterproof water vapor-transmitting insert, containing a fibrous textile scrim layer; and
  - (c) an outer protective shell wherein said insulation, said insert, and said shell are attached to each other at the cuff of said glove;

wherein fibers of the fibrous insulation or the shell are entangled with fibers of said fibrous textile scrim.

8. A hand covering of Claim 1 having an additional layer of textile scrim bonded to the outside of said waterproof insert and an outer protective shell having a roughened interior surface or an entangleable layer bonded to said interior surface.
9. A lined waterproof hand covering comprising in order inside to outside:
  - (a) a layer of fibrous insulation;
  - (b) a waterproof insert having a layer of textile scrim bonded to the outside of said insert; and
  - (c) an outer protective shell having a roughened interior surface or an entangleable layer bonded to said interior surface.
10. A hand covering of Claims 6, 7, 8 or 9 in the form of a mitten.

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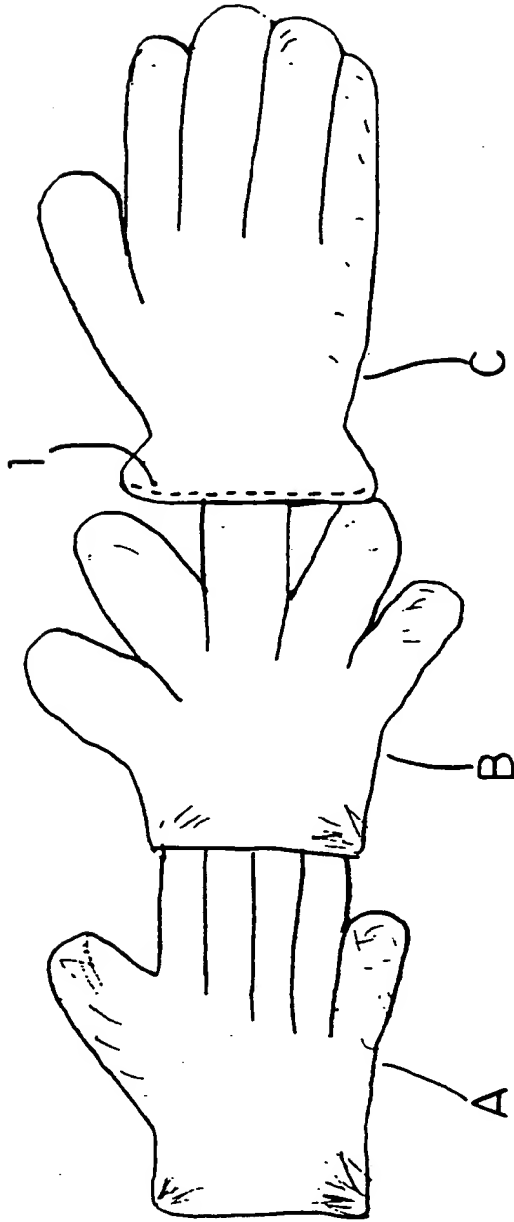


FIG. 1

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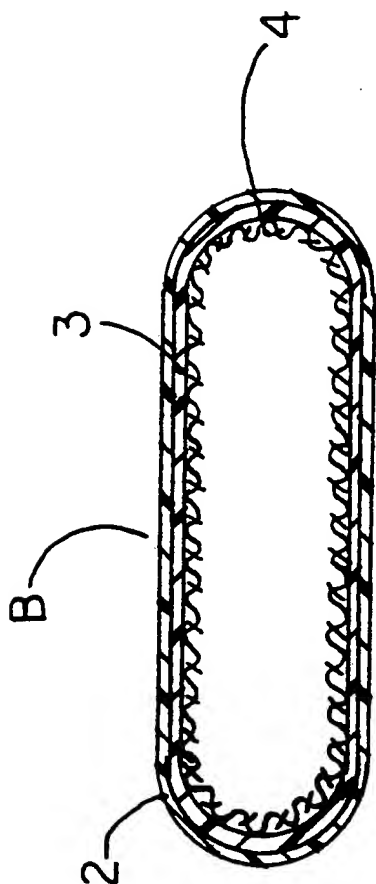


FIG. 2

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FIG. 3

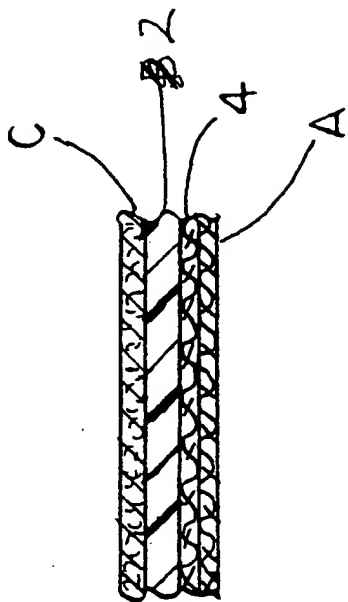


FIG. 5

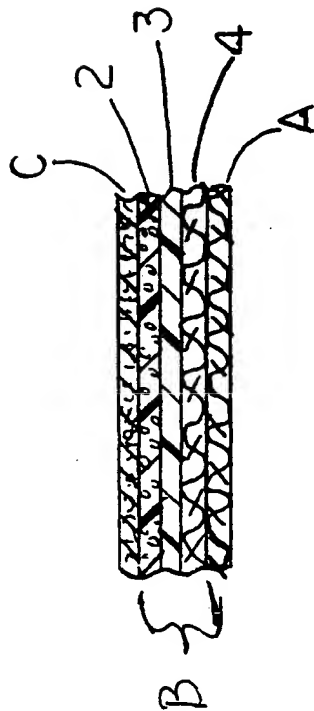


FIG. 4

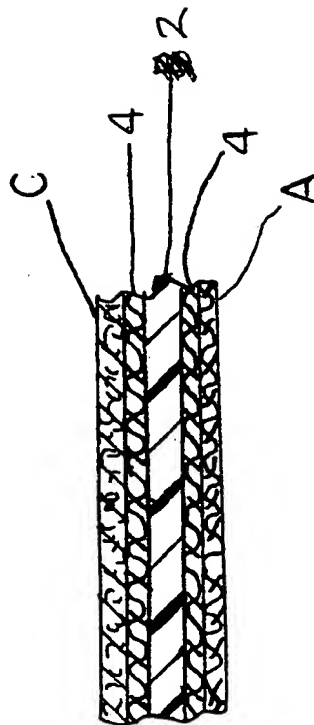
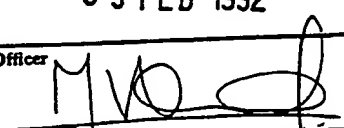


FIG. 6

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 91/07709

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC Int.Cl. 5 A41D19/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
Int.Cl. 5	A41D	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	US,A,4 662 006 (CHARLES ROSS JR) 5 May 1987 the whole document and especially column 2 line 6-27	1-10
X	DE,U,8 715 686 (DR N. VOACK) 14 January 1988 see the whole document	1-10
X	NL,A,6 503 302 (NITEX-SCHAUMSTOFFFABRIK WOLFGANG ANGER) 31 May 1966	1-10
A	US,A,4 583 248 (J.H. EDWARDS) 22 April 1986 see the whole document	1-10
A	US,A,4 430 759 (D. JACKREL) 14 February 1984 see the whole document	1-10
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<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search 22 JANUARY 1992	Date of Mailing of this International Search Report 05 FEB 1992	
International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer VANMOL M. 	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9107709  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4662006	05-05-87	None	
DE-U-8715686	14-01-88	None	
NL-A-6503302	31-05-66	None	
US-A-4583248	22-04-86	None	
US-A-4430759	14-02-84	US-A- 4520056 US-A- 4545841	28-05-85 08-10-85